SOUTH DAKOTA STATEWIDE FISHERIES SURVEY

2102-F-21-R-42

Name: Lake Henry **County**: Bon Homme
Legal Description: T96-R58-Sec.9-10
Location from nearest town: 1 mile south, 1 mile east of Scotland, SD

Dates of present survey: August 17-19, 2009 (netting) May 27, 2009 (electrofishing)
Date last surveyed: August 20-22, 2007 (netting) June 5, 2007 (electrofishing)

Primary Game Species	Other Species
Largemouth Bass	White Sucker
Yellow Perch	Common Carp
Channel catfish	Black Bullhead
Black Crappie	Green sunfish
Bluegill	Hybrid sunfish

PHYSICAL DATA

Surface Area: 165 acres (est.) **Watershed**: 34,699 acres
Maximum depth: 35 feet (est.) **Mean depth**: 18 feet (est.)
Volume: No data **Shoreline length**: No data
Contour map available: No **Date mapped**: NA
OHWM elevation: No data **Date set**: NA
Outlet elevation: No data **Date set**: NA
Lake elevation observed during the survey: Full
Beneficial use classifications: (4) warmwater permanent fish propagation, (7) immersion recreation, (8) limited-contact recreation, (9) fish and wildlife propagation and stock watering.

Introduction

Lake Henry was created by the construction of a dam across Dawson Creek in 1937. It was named in honor of State Senator Henry Brown of Bon Homme County. The lake quickly became a popular water-based recreation spot for the area. By the late 1980s, however, decades of erosion from the watershed had degraded the lake and use had declined considerably.

Plans to renovate the lake began in 1991 after extensive damage to the spillway was discovered. In 1994, the dam was breached and the lake drained to allow spillway repairs and the removal of accumulated sediments. The renovation project quickly ground to a halt when funding was withdrawn and the lake remained dry for nearly a decade.

In 2002, funding for the project was restored. It was determined more economical to build a new dam rather than rebuild the old one. A new site was chosen ⅜ of a mile downstream and construction began late in 2002. The dam was completed in 2003 and completely filled with water in 2005.

Ownership of Lake and Adjacent Shoreline Property

Lake Henry and all surrounding shoreline is owned and managed by the South Dakota Department of Game, Fish and Parks.

Fishing Access

Lake Henry has a two lane boat ramp with a dock located on the southeast corner of the lake near the dam face. There are toilets located near the boat ramp and on the north access area. A handicapped accessible fishing dock is located on the southwest side of the lake. Numerous shore access sites were developed on both sides of the lake and habitat structures were placed to benefit shore anglers. All of Lake Henry has been designated a no-wake zone. At no time may any boat create a visible wake or exceed five miles per hour. This was done to protect the shorelines from erosion and to maintain a quiet and peaceful environment.

Field Observations of Water Quality and Aquatic Vegetation

The water in Lake Henry was very clear during the survey with a Secchi depth measurement of 2.5m (8.2 ft). Cattails (*Typha spp.*) were present around the entire lake. Flooded trees were also present especially in the southeast part of the lake.

BIOLOGICAL DATA

Methods:

Lake Henry was sampled on August 17-19, 2009 with ten overnight trap-net sets. The trap nets are constructed with 19-mm-bar-mesh (¾ in) netting, 0.9 m high x 1.5 m wide (3 ft high x 5 ft wide) frames and 18.3 m (60 ft) long leads. One hour and twenty minutes of nighttime electrofishing were done on May 27, 2009 to assess the largemouth bass population.

Results and Discussion:

Trap Net Catch

Black crappie (59.2%), bluegill (23.1%), and white sucker (9.6%) were the most abundant species sampled in the trap nets (Table 1). Other species caught included black bullhead, common carp, green sunfish, hybrid sunfish, and yellow perch.

Table 1. Total catch from ten overnight trap net sets at Lake Henry, Bon Homme County, August 17-19, 2009.

Species	Number	Percent	CPUE[1]	80% C.I.	Mean CPUE*	PSD	RSD-P	Mean Wr
Black Crappie	308	59.2	30.8	±9.2	10.1	67	2	96
Bluegill	120	23.1	12.0	±4.2	12.3	88	3	88
White Sucker	61	11.7	6.1	±4.3	5.2	100	98	87
Black Bullhead	23	4.4	2.3	±1.3	96.7	93	66	83
Common Carp	2	0.4	0.2	±0.2	0.7	--	--	--
Green Sunfish	2	0.4	0.2	±0.2	1.2	--	--	--
Hybrid Sunfish	2	0.4	0.2	±0.2	0.3	--	--	--
Yellow Perch	2	0.4	0.2	±0.2	8.2	--	--	--

* Three years (2004, 2005, 2007)

Largemouth Bass

Management objective: Maintain a largemouth bass fishery with an electrofishing CPUE of at least 20 and an RSD-P range of 20-40.

Electrofishing catch per hour (CPUE) decreased in 2009 but is still well above the management objective (Table 2). Bass recruitment has been relatively consistent (Table 3) with fish from the 2005-2007 year classes originating exclusively from natural reproduction (Table 3). Growth is slower than regional means but faster than statewide means (Table 3). Unlike bass populations in many of the Region III small impoundments, the size structure of this population is dominated by smaller fish (Figure 2) suggesting that angler harvest of larger bass (> 15 inches) may be significant.

Table 2. Largemouth bass electrofishing CPUE, PSD, RSD-P and mean Wr for Lake Henry, Bon Homme County, 2001-2009.

	2001	2002	2003	2004	2005	2006	2007	2008	2009
CPUE					77.4		118.5		45.0
PSD					35		51		28
RSD-P					6		8		9
Mean Wr					106		92		96

[1] See Appendix A for definitions of CPUE, PSD, RSD-P and mean Wr.

Table 3. Average back-calculated lengths (mm) for each age class of largemouth bass in Lake Henry, Bon Homme County, 2009.

			Back-calculation Age							
Year Class	Age	N	1	2	3	4	5	6	7	8
2007	2	24	111	202						
2006	3	8	111	211	245					
2005	4	11	93	174	236	272				
2004	5	5	107	183	269	303	328			
2003	6	2	140	231	317	362	383	418		
All Classes		**50**	**112**	**200**	**267**	**312**	**355**	**418**		
Statewide Mean			96	182	250	305	342			
Region III Mean			111	212	287	347	383			
LLI* Mean			89	178	256	316	359			

*Large Lakes and Impoundments (>150 acres)

Bluegill

Management objective: Maintain a bluegill fishery with a trap-net CPUE of at least 20 and RSD-18 of at least 20.

Bluegill abundance (CPUE) fell below the management objective but the size structure has improved with 53% of the fish sampled longer than 18 cm (7 inches) (Table 4). Growth of bluegills continues to be good and better than growth in many of our small impoundments (Table 5).

Table 4. Bluegill trap-net CPUE, PSD, RSD-P, and mean Wr for Lake Henry, Bon Homme County, 2001-2009.

	2001	2002	2003	2004	2005	2006	2007	2008	2009
CPUE				0.0	7.9		28.8		12.0
PSD				--	18		80		88
RSD-18				--	3		10		53
RSD-P				--	1		0		3
Mean Wr				--	114		97		88

Table 5. Average back-calculated lengths (mm) for each age class of bluegills in Lake Henry, Bon Homme County, 2009.

			Back-calculation Age							
Year Class	Age	N	1	2	3	4	5	6	7	8
2007	2	8	44	83						
2006	3	52	54	111	159					
2005	4	43	46	102	151	172				
2004	5	14	50	106	149	170	185			
All Classes		**117**	**48**	**100**	**153**	**171**	**185**			
Statewide Mean			55	103	141	166				
Region III Mean			60	116	157	180				
SLI* Mean			53	101	138	163				

*Small Lakes and Impoundments (<150 acres)

Black Crappie

Management objective: Maintain a crappie fishery with a trap-net CPUE of at least 20 and PSD of at least 40.

The black crappie CPUE and PSD exceeded the management objectives (Table 6) and the fish sampled ranged in length from 12 to 26 cm (4.7-10.2 in) with an average length of 206 mm (8.1 in). Growth of black crappies continues to be good and better than many of our small impoundments (Table 7).

Table 6. Black Crappie trap-net CPUE, PSD, RSD-P, and mean Wr for Lake Henry, Bon Homme County, 2001-2009.

	2001	2002	2003	2004	2005	2006	2007	2008	2009
CPUE				0.5	1.6		28.2		30.8
PSD				--	56		27		67
RSD-P				--	31		4		2
Mean Wr				--	103		100		96

Table 7. Average back-calculated lengths (mm) for each age class of black crappie in Lake Henry, Bon Homme County, 2009.

			Back-calculation Age							
Year Class	Age	N	1	2	3	4	5	6	7	8
2008	1	88	82							
2007	2	74	76	144						
2006	3	126	76	158	206					
2005	4	20	85	142	189	220				
All Classes		**308**	**80**	**148**	**198**	**220**				
Statewide Mean			83	147	195	229	249			
Region III Mean			95	167	219	253	274			
SLI* Mean			78	134	180	209	226			

*Small Lakes and Impoundments (<150 acres)

Black Bullhead

Management objective: Maintain a bullhead fishery with a trap-net CPUE of no more than 100.

The high-density largemouth bass population is apparently able to limit recruitment of small bullheads. Lake Henry contains a low-density population comprised of mostly larger fish (Figure 1) with a mean length is 296 mm (11.65 inches).

Table 8. Black bullhead trap-net CPUE, PSD, RSD-P, and mean Wr for Lake Henry, Bon Homme County, 2001-2009.

	2001	2002	2003	2004	2005	2006	2007	2008	2009
CPUE				73.3	210.2		6.5		2.3
PSD				1	77		97		93
RSD-P				0	0		22		66
Mean Wr				85	90		90		83

All Species

Yellow perch abundance has steadily decreased since their introduction after the renovation (Table 9). Common carp have also declined.

Table 9. Electrofishing (EF) and trap-net (TN) CPUE for all fish species sampled in Lake Henry, Bon Homme County, 2001-2009.

Species	2001	2002	2003	2004	2005	2006	2007	2008	2009
COC (TN)				0.5	1.4		0.2		0.2
WHS (TN)				8.5	4.5		2.7		6.1
BLB (TN)				73.3	210.2		6.5		2.3
CCF (TN)				1.0	0.5		0.1		--
GSF (TN)				1.5	1.7		0.4		0.2
HYB (TN)				--	0.5		0.3		0.2
BLG (TN)				--	7.9		28.8		12.0
SMB (TN)				0.2	--		--		--
LMB (TN)				1.0	0.2		0.2		--
LMB (EF)				--	77.4		118.5		45.0
BLC (TN)				0.5	1.6		28.2		30.8
YEP (TN)				16.0	8.3		0.3		0.2

COC (Common Carp), WHS (White Sucker), BLB (Black Bullhead), CCF (Channel Catfish), GSF (Green Sunfish), HYB (Hybrid Sunfish), BLG (Bluegill), SMB (Smallmouth Bass), LMB (Largemouth Bass), BLC (Black Crappie), YEP (Yellow Perch),

MANAGEMENT RECOMMENDATIONS

1. Conduct biennial netting and electrofishing surveys to monitor the fishery.

Table 10. Stocking record for Lake Henry, Bon Homme County, 2003-2009.

Year	Number	Species	Size
2003	12	Bluegill	Juvenile
	5	Bluegill	Adult
	204,460	Fathead Minnow	Adult
	18,510	Largemouth Bass	Juvenile
	105	Largemouth Bass	Adult
	39,262	Yellow Perch	Fingerling
	363	Yellow Perch	Adult
2004	1,829	Black Crappie	Adult
	1,510	Bluegill	Adult
	500	Channel Catfish	Adult
	1,029	Largemouth Bass	Adult
	400	Largemouth Bass	Juvenile
	1,016	Yellow Perch	Adult
	2,448	Yellow Perch	Fingerling

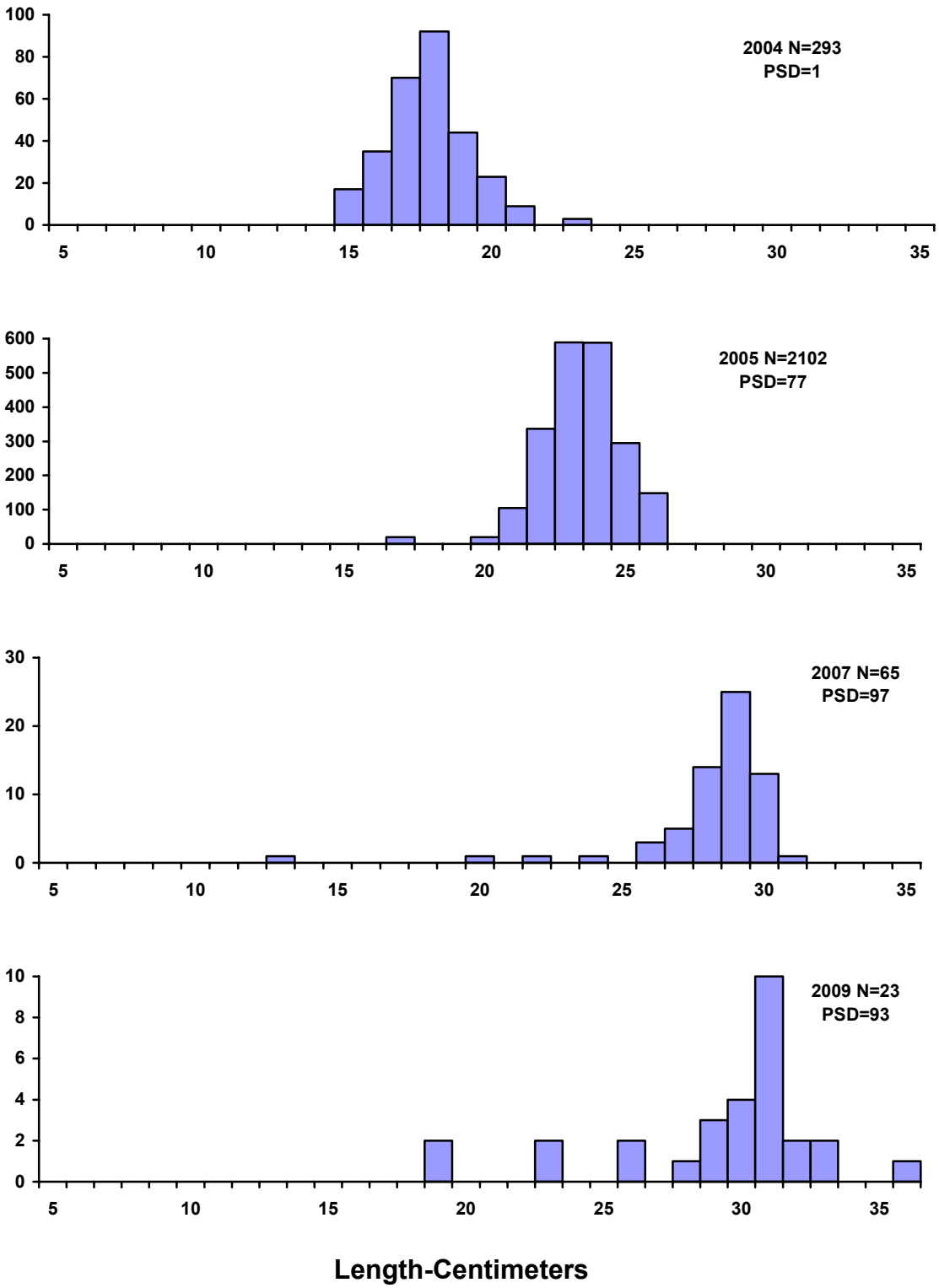

Figure 1. Length frequency histograms of black bullheads from Lake Henry, Bon Homme County, 2004, 2005, 2007, and 2009.

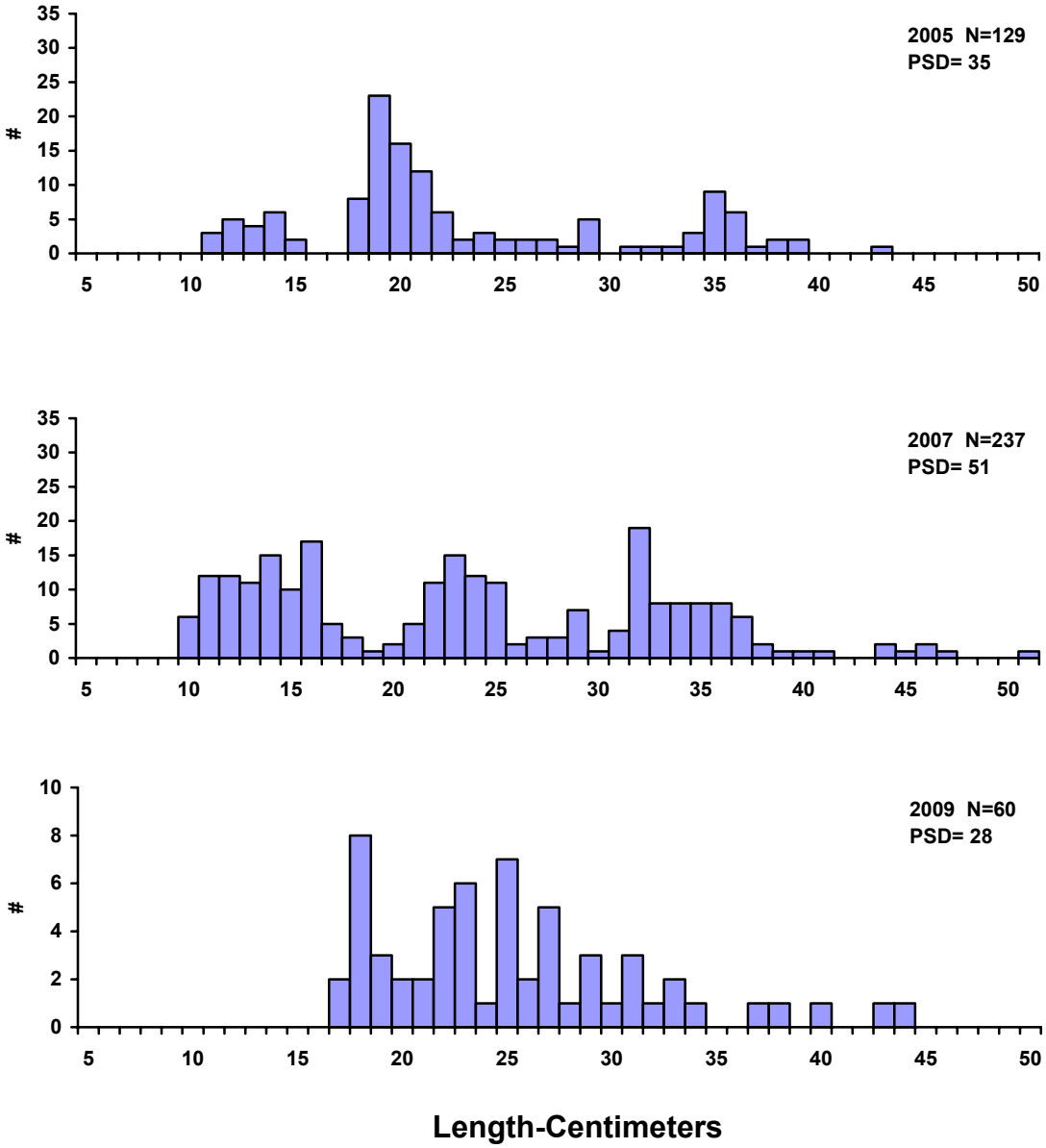

Figure 2. Length frequency histogram of largemouth bass from Lake Henry, Bon Homme County, 2005, 2007, and 2009.

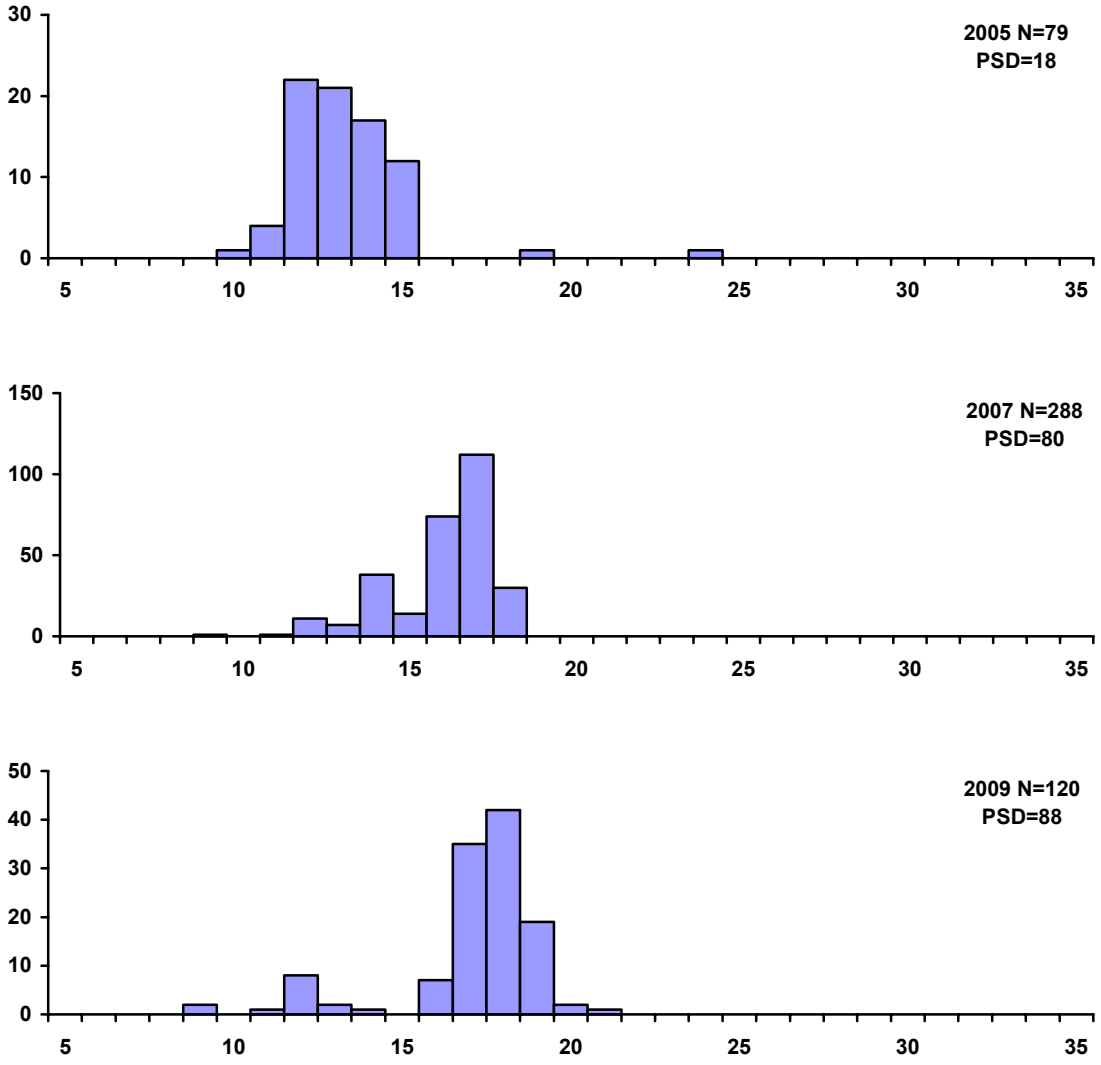

Figure 3. Length frequency histograms of bluegills from Lake Henry, Bon Homme County, 2005, 2007, and 2009.

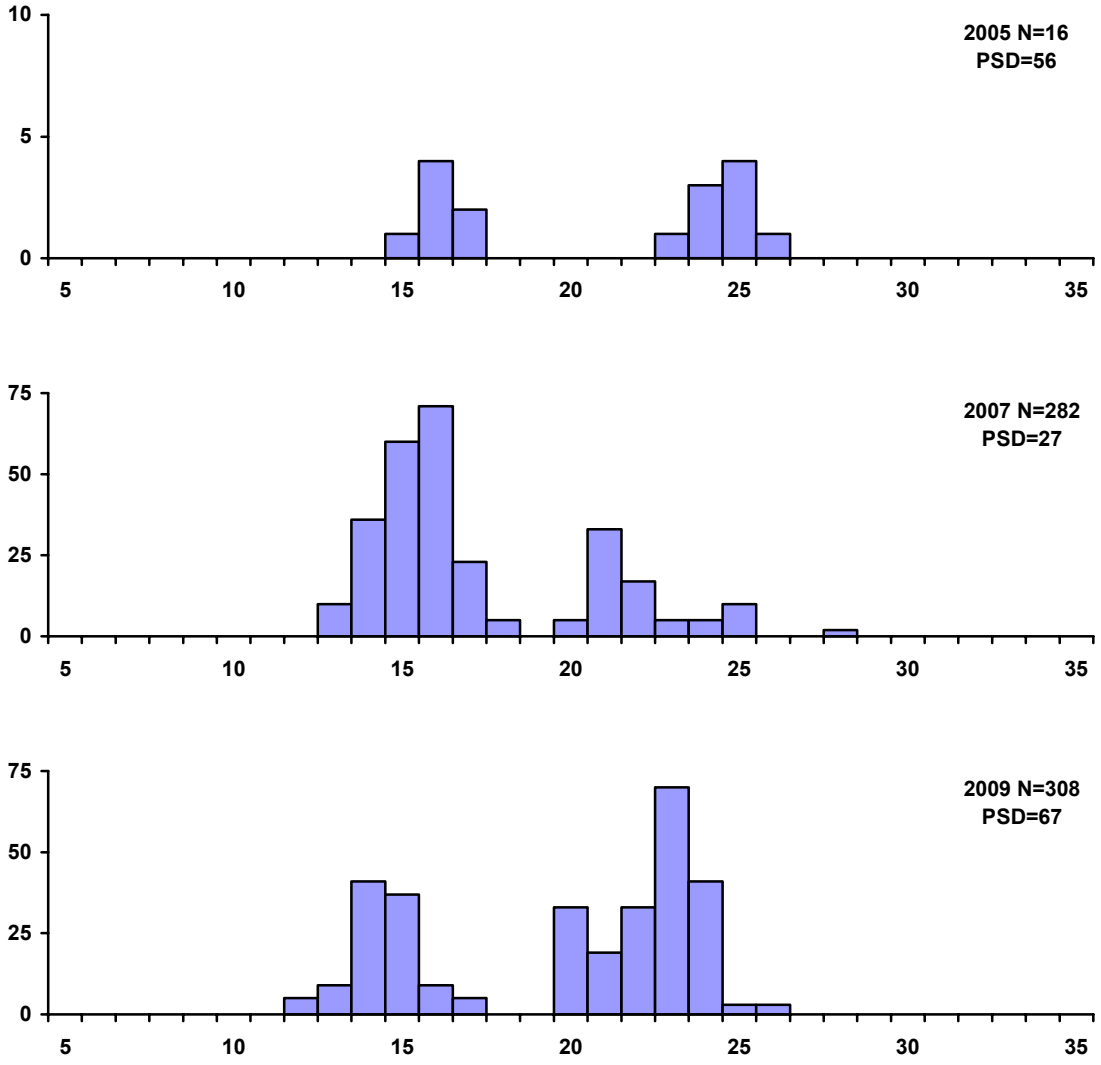

Figure 4. Length frequency histograms of black crappies from Lake Henry, Bon Homme County, 2005, 2007, and 2009.

Appendix A. A brief explanation of catch per unit effort (CPUE), proportional stock density (PSD), relative stock density (RSD) and relative weight (Wr).

Catch Per Unit Effort (CPUE) is the catch of animals in numbers or in weight taken by a defined period of effort. Can refer to trap-net nights of effort, gill-net nights of effort, catch per hour of electrofishing, etc.

Proportional Stock Density (PSD) is calculated by the following formula:

$$PSD = \frac{\text{Number of fish} > \text{quality length}}{\text{Number of fish} \geq \text{stock length}} \times 100$$

Relative Stock Density (RSD-P) is calculated by the following formula:

$$RSD\text{-}P = \frac{\text{Number of fish} > \text{preferred length}}{\text{Number of fish} \geq \text{stock length}} \times 100$$

PSD and RSD-P are unitless and usually calculated to the nearest whole digit.

Size categories for selected species found in Region 3 lake surveys, in centimeters.

Species	Stock	Quality	Preferred	Memorable	Trophy
Walleye	25	38	51	63	76
Sauger	20	30	38	51	63
Yellow perch	13	20	25	30	38
Black crappie	13	20	25	30	38
White crappie	13	20	25	30	38
Bluegill	8	15	20	25	30
Largemouth bass	20	30	38	51	63
Smallmouth bass	18	28	35	43	51
Northern pike	35	53	71	86	112
Channel catfish	28	41	61	71	91
Black bullhead	15	23	30	38	46
Common carp	28	41	53	66	84
Bigmouth buffalo	28	41	53	66	84
Smallmouth buffalo	28	41	53	66	84

For most fish, 30-60 or 40-70 are typical objective ranges for “balanced” populations. Values less than the objective range indicate a population dominated by small fish while values greater than the objective range indicate a population comprised mainly of large fish.

Relative weight (Wr) is a condition index that quantifies fish condition (i.e., how much does a fish weigh for its length). A Wr range of 90-100 is a typical objective for most fish species. When mean Wr values are well below 100 for a size group, problems may exist in food and feeding relationships. When mean Wr values are well above 100 for a size group, fish may not be making the best use of available prey.